

Number Sense Day 1

Overview of Course

- ▶ PA Common Core Content Standards
- ▶ Standards of Mathematical Practice
- ▶ What is number sense
- ▶ How do we develop number sense

Agenda

- ▶ Professional Norms
- ▶ Standards for Mathematical Practice
- ▶ What Is Number Sense?
- ▶ Read and Discuss “Teaching Number Sense”
- ▶ Counting Activity
- ▶ How Do You Develop Number Sense?
- ▶ Quick Images
- ▶ Quick Images Video
- ▶ Planning

Working Together

- ▶ Take a minute and think about what would make this a risk-free learning environment.

Standards for Mathematical Practice

Take time to read the Standards for Mathematical Practice.

- ▶ What is something that stood out/interested you? Something you have a question about?
- ▶ As a table group, discuss: To what extent do you think these practices are embedded in the daily work of teachers and students?

What is number sense?

- ▶ **Take a few minutes to jot down a few thoughts about what number sense is.** Fill in the left side of your sheet.

I think number sense is ...	But now I know it is . . .

Number Sense is...

- ▶ understanding the relationships between and among numbers,
- ▶ having the ability to think flexibly about numbers and to break numbers apart and put them back together,
- ▶ being familiar with the properties of single digit numbers and using this information to calculate efficiently using larger numbers,
- ▶ having the ability to manipulate numbers in their head, and
- ▶ having effective ways to estimate.

M. Burns

Number Sense is ...

“good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms.”

H. Howden

▶ How are the Standards for Mathematical Practice connected to developing number sense?

- ▶ How and where do the PA CC Math and CCSSM standards address the topic of number sense?

Students who struggle in math often lack number sense.

They find it difficult to

- ▶ **Compute**
- ▶ **Find relationships among numbers or equations**
- ▶ **Figure out problems involving geometry, measurement, and data**

Teaching Number Sense

- ▶ Read the article “Teaching Number Sense.”
- ▶ Be ready to discuss the following:
 - Why is number sense important?
 - How do you know if a student has number sense?

Counting: the basis for number sense

Students must know:

- ▶ The sequence of number names, both starting at 1 and not starting at 1
- ▶ How to count a set, keeping track of the items they counted
- ▶ Skip counting from 1 and from other numbers
- ▶ Cardinality
- ▶ Conservation
- ▶ 1-to-1 correspondence
- ▶ Making tens – link to understanding place value
- ▶ Subitizing

Counting – from a child's perspective

Since we are familiar with numbers, we will use letters.

A = 1

B = 2

C = 3

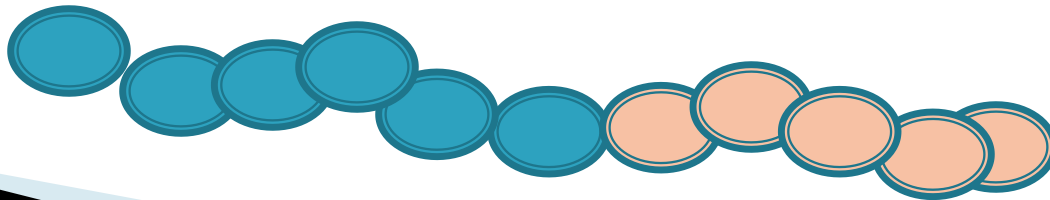
D = 4 and so forth.

Do NOT continue this key.

Counting – from a child’s perspective

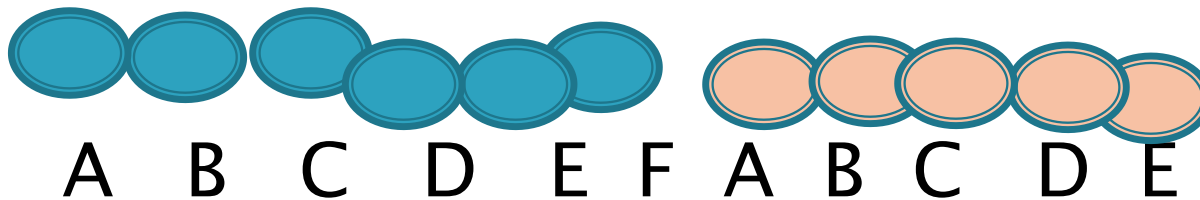
Now that we have counting down . . .
What is

$$F + E =$$



Counting – from a child’s perspective

$$F + E =$$



Counting – from a child's perspective

$$E + D =$$

Find the sum without counters.

Counting – from a child's perspective

$$G + E =$$

Find the sum without counters or fingers.

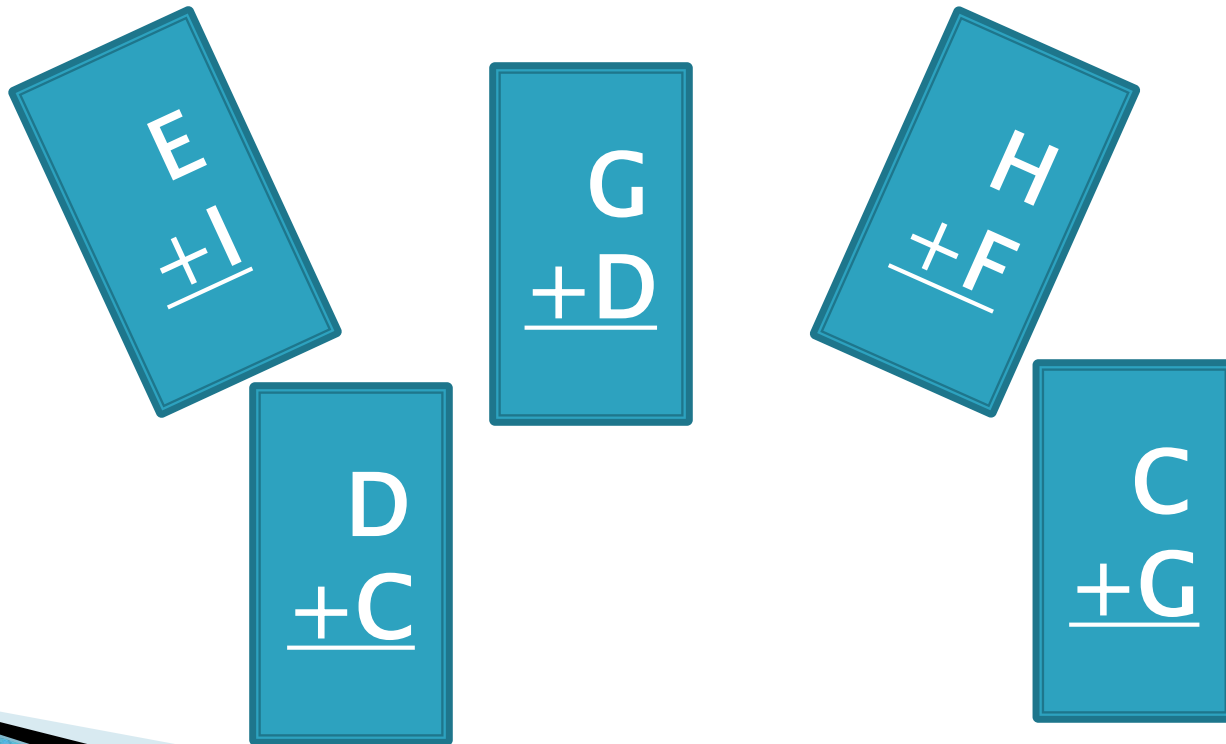
Counting – from a child's perspective

Now, you should know the facts!!



Counting – from a child’s perspective

Now, you should know the facts!!



Counting – from a child's perspective

$$H - C = ___$$

**Subtract counting backward by
using your fingers.**

Counting – from a child's perspective

$$J - F = ___$$

Subtract counting backward without fingers.

Counting with the Alphabet Problems

- ▶ Max had some money. He spent J dollars on a video game. Now he has G dollars left. How much money did Max have to start with?
- ▶ Willy has L crayons. Lucy has G crayons. How many more crayons does Willy have than Lucy?
- ▶ K children were playing in the sandbox. Some children went home. There were C children still playing in the sandbox. How many children went home?



Counting – from a child's perspective

**Try skip counting by Bs
to T:**

B, D,, T.

Counting – from a child’s perspective

Special cases of place value

L

is a “bundle” of J A’s and BA’s.

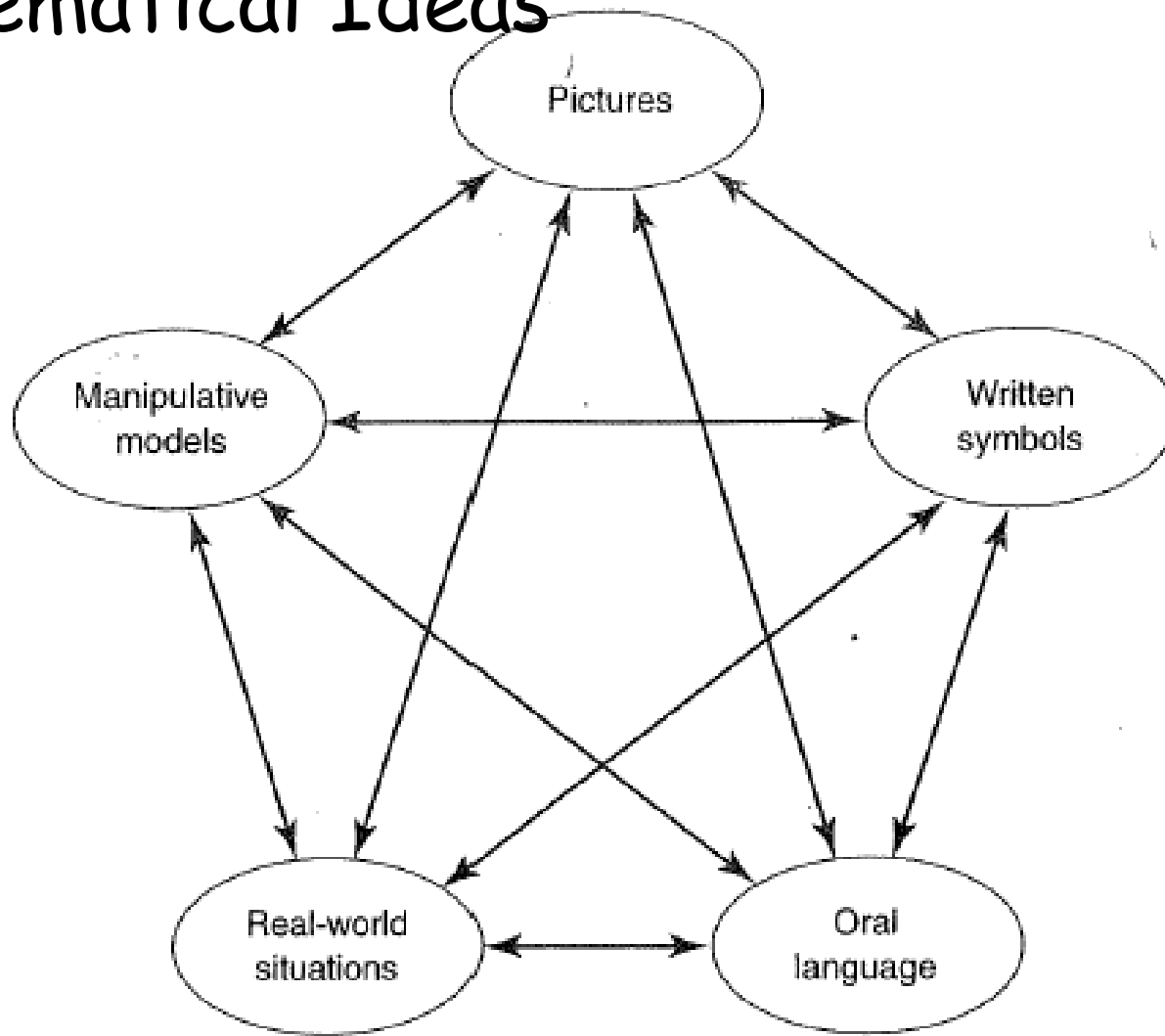
Counting – from a child’s perspective

Special cases of place value

L (12)

is a “bundle” of J A’s (ten ones) and
BA’s (two ones).

Different Representations of Mathematical Ideas



Reflecting





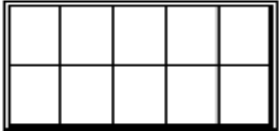
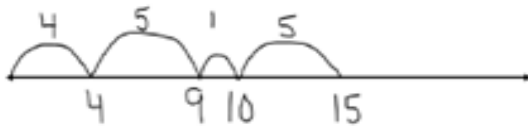
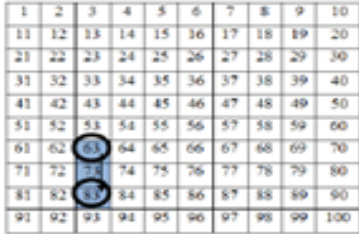
- ▶ As you were engaging in this activity, what things did you notice?
- ▶ Which Standard(s) for Mathematical Practice where you most engaged in during the alphabet activity?
- ▶ CC.2.1.K.A.21 Know number names and write and recite the count sequence.
- ▶ CC.2.2.1.A.1 Represent and solve problems involving addition and subtraction within 20.

- ▶ Look at your I think I knew but now I know chart, and think about what students who have number sense would be able to do based on what you know number sense is.

Students with number sense . . .

- ▶ Naturally decompose numbers
- ▶ Can visualize quantities
- ▶ Develop and use benchmarks as referents
- ▶ Use the relationships among operations and their knowledge of the base-ten number system to solve problems
- ▶ Estimate a reasonable result for a problem
- ▶ Have a disposition to make sense of numbers, problems, and results

Models and Tools:

Dot images	
<u>Rekenreks</u>	 
Five- and ten-frames	 
Number line	Solving $4 + 5 + 1$ 
Hundred chart	<div data-bbox="813 1075 1052 1168" style="border: 1px solid black; padding: 5px; display: inline-block;">$63 + 10 = 73$ $73 + 10 = 83$</div> 

Developing Number Sense: Visuals

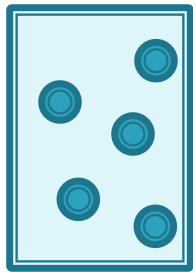
- ▶ Develop students' understanding of a quantity
- ▶ Give numbers meaning
- ▶ Help students see the relationships of numbers to one another
- ▶ Helps students move from perceptual to conceptual subitizing
 - Children who can subitize perform better in mathematics in the long run (Butterworth).
- ▶ Support understanding of how numbers operate

Quick Images

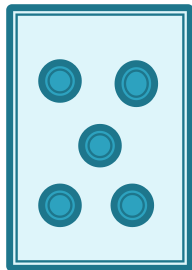
- ▶ Use a variety of models and visual arrangements
- ▶ Have students construct image, especially at first, and discuss their strategy
- ▶ Allows students to see math ideas within a mixture of formats
- ▶ Helps students think flexibly and encourages deep understanding for subitizing
- ▶ Show the images in a related order

Dot cards

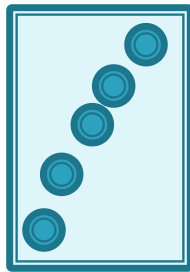
- ▶ Important factor in design of cards is arrangement of dots.
- ▶ Consider the dot cards below.
 - What mental strategies are likely to be prompted by each card?
 - What order would you place them in according to level of difficulty?



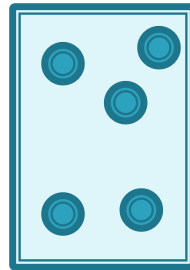
A



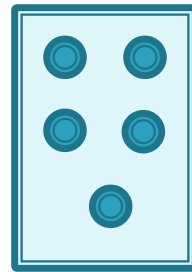
B



C



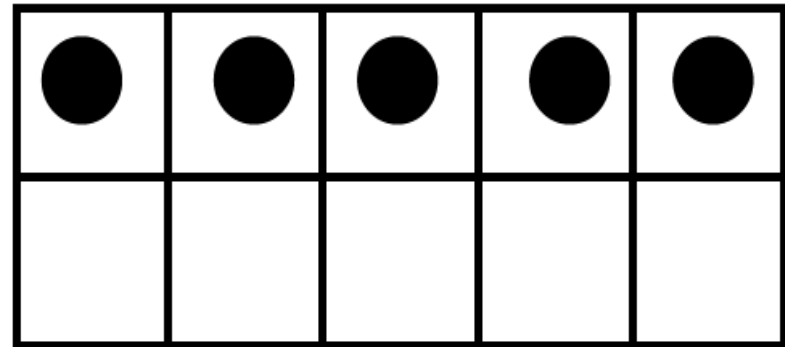
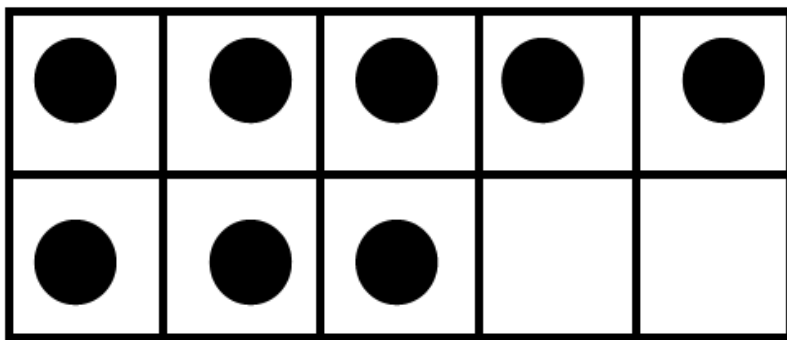
D



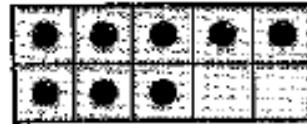
E

Ten Frames

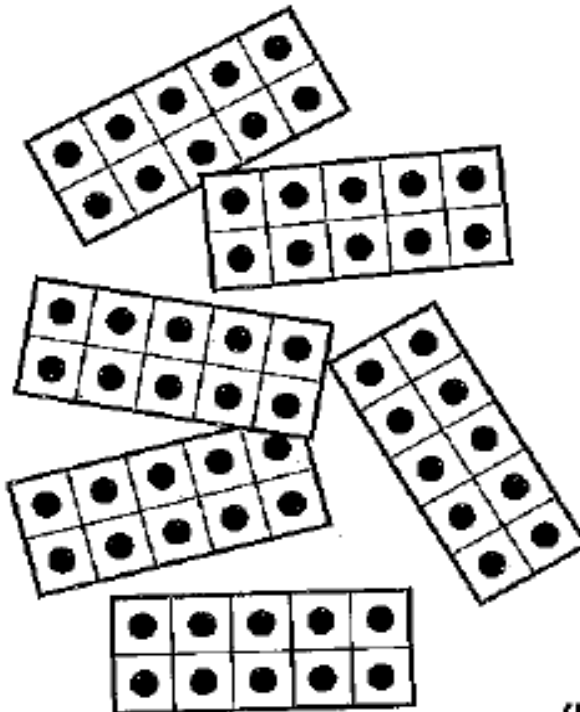
- ▶ Highlight use of 5– and 10–structures of our number system
- ▶ Frame shows quantity's relationship to 10
- ▶ Helps compose and decompose 10



Extending Ten Frame Thinking

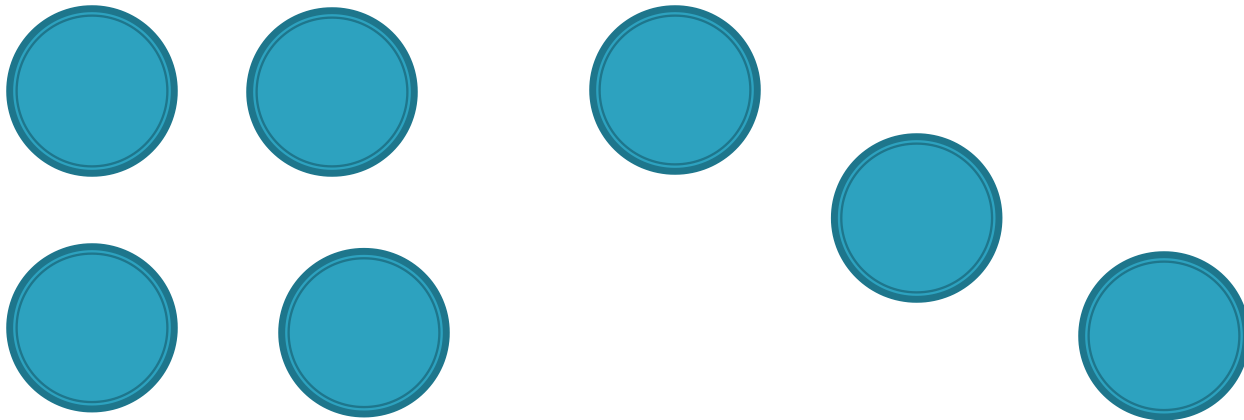


8 and 5 more:
2 from 5 to get to 10
and 3 more is 13.

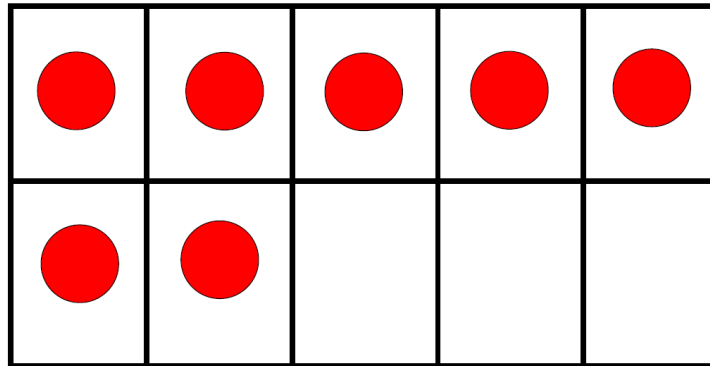


So ...
68 and 5:
2 more to
get to 70
and 3 is 73.

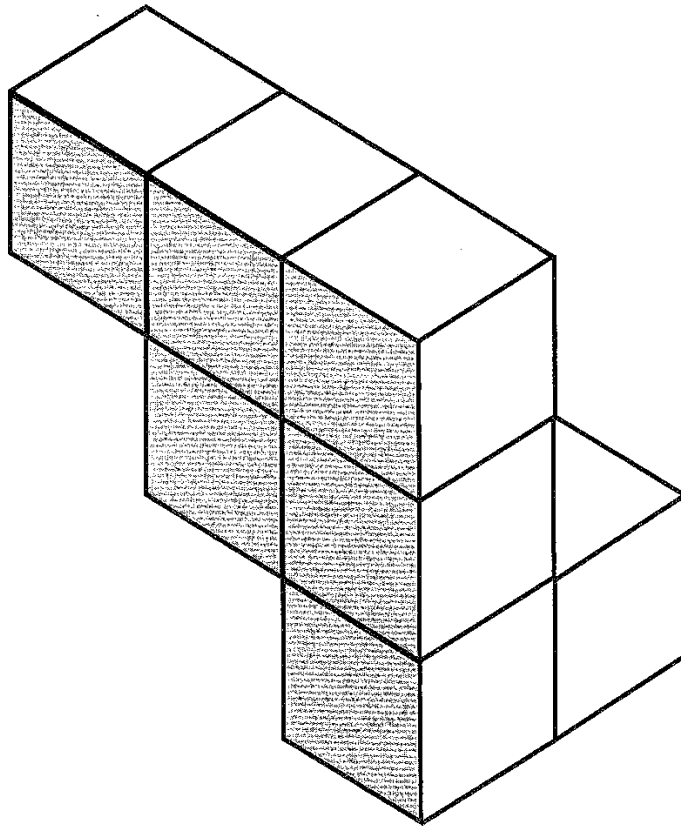




Ten Frames



Cubes



Similarities & Differences

- ▶ Think about the dots, the ten-frame, and the cubes. What was the same and what was different about the representations?

Quick Images Video

- ▶ How does the teacher try to make the mathematics of the lesson explicit?
- ▶ How does he structure this activity?
- ▶ What decisions and moves does the teacher make?
- ▶ What questions does he ask?
- ▶ What statements does he make?

Quick Images Video

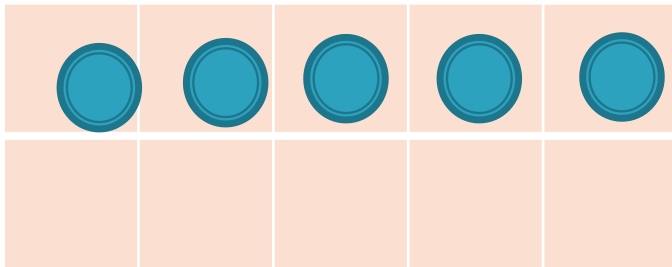
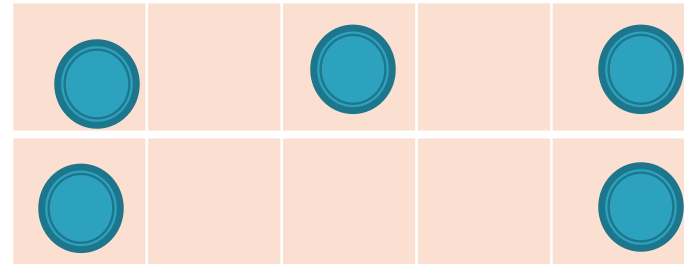
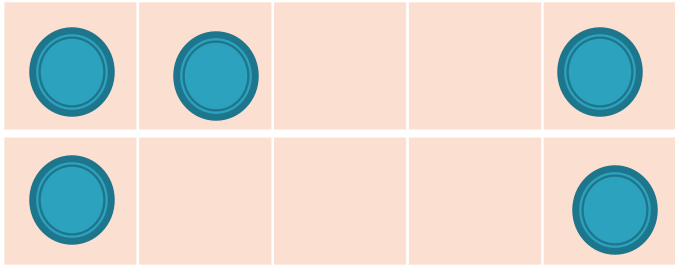
- ▶ Did you see any evidence that students were or were not subitizing?
- ▶ What role does subitizing play in the Quick Images activity?

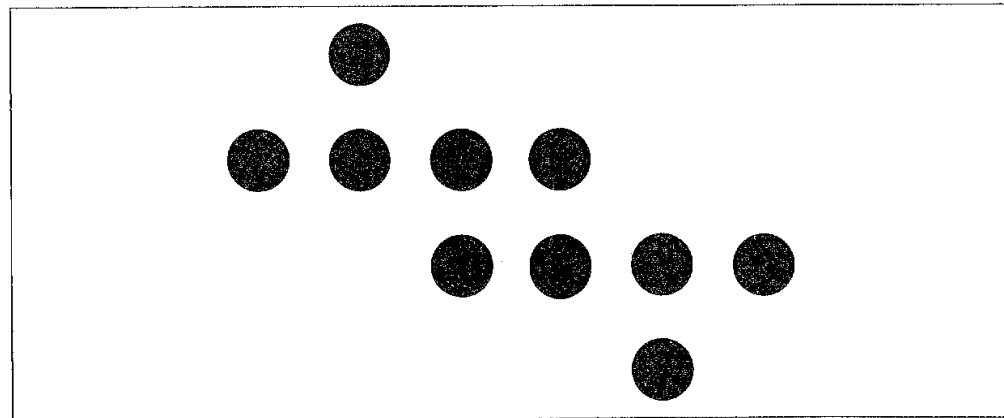
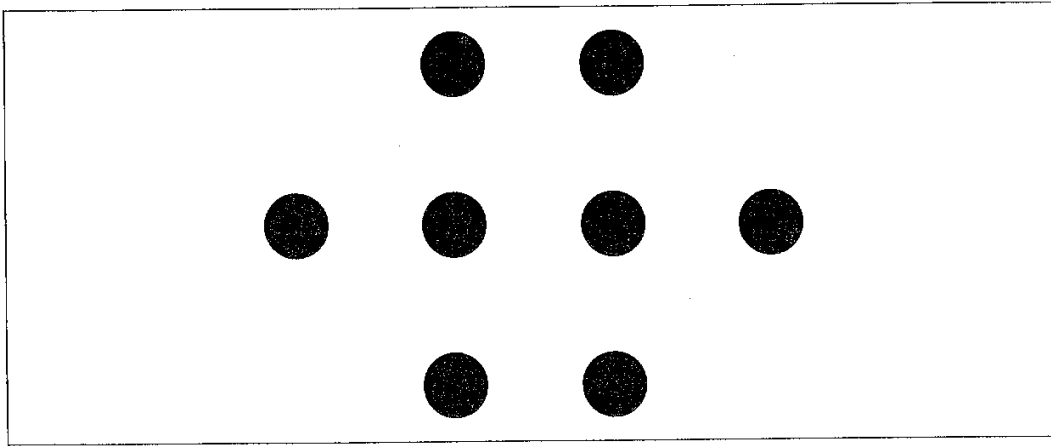
Strategies to Build Number Sense

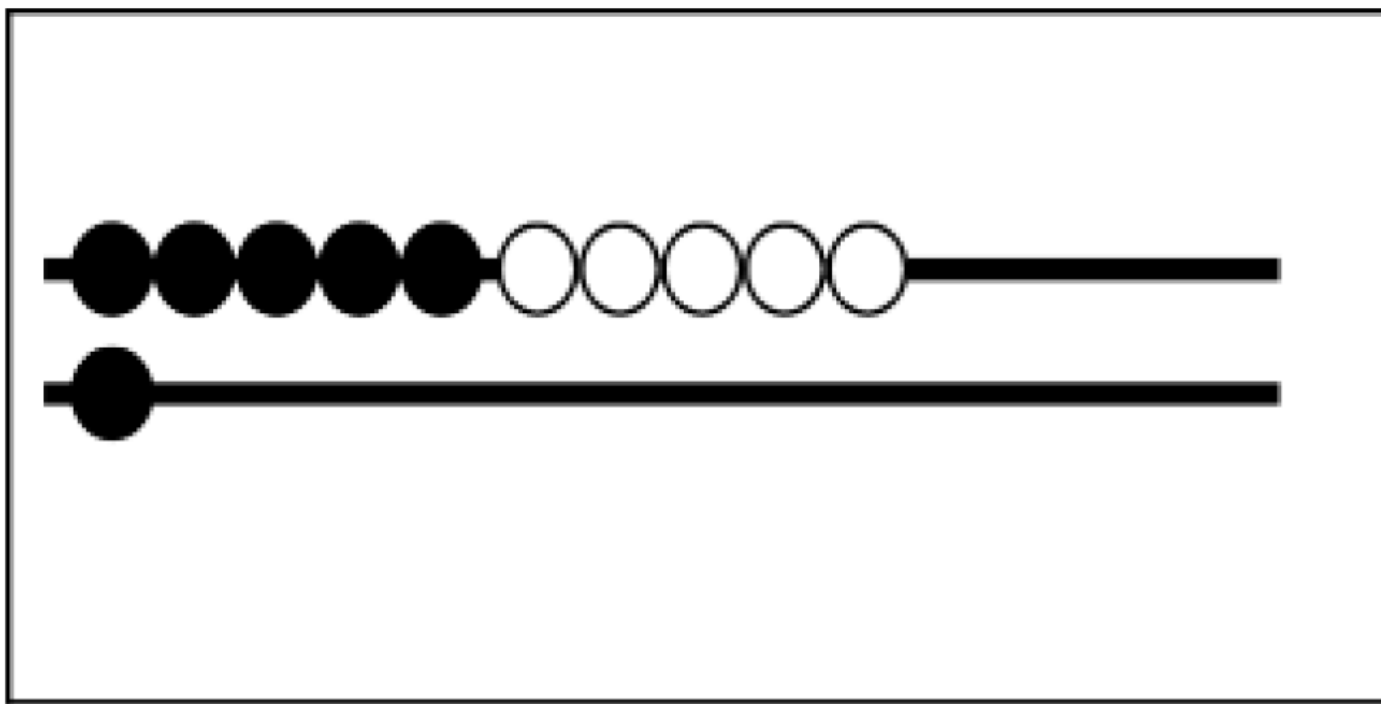
- ▶ Model different methods for computing.
- ▶ Ask students regularly to calculate mentally.
- ▶ Have class discussions about strategies for computing.
- ▶ Make estimation an integral part of computing.
- ▶ Question students about how they reason numerically.
- ▶ Pose numerical problems that have more than one possible answer.
- ▶ Pose real-life problems.
- ▶ Have students use visual models.

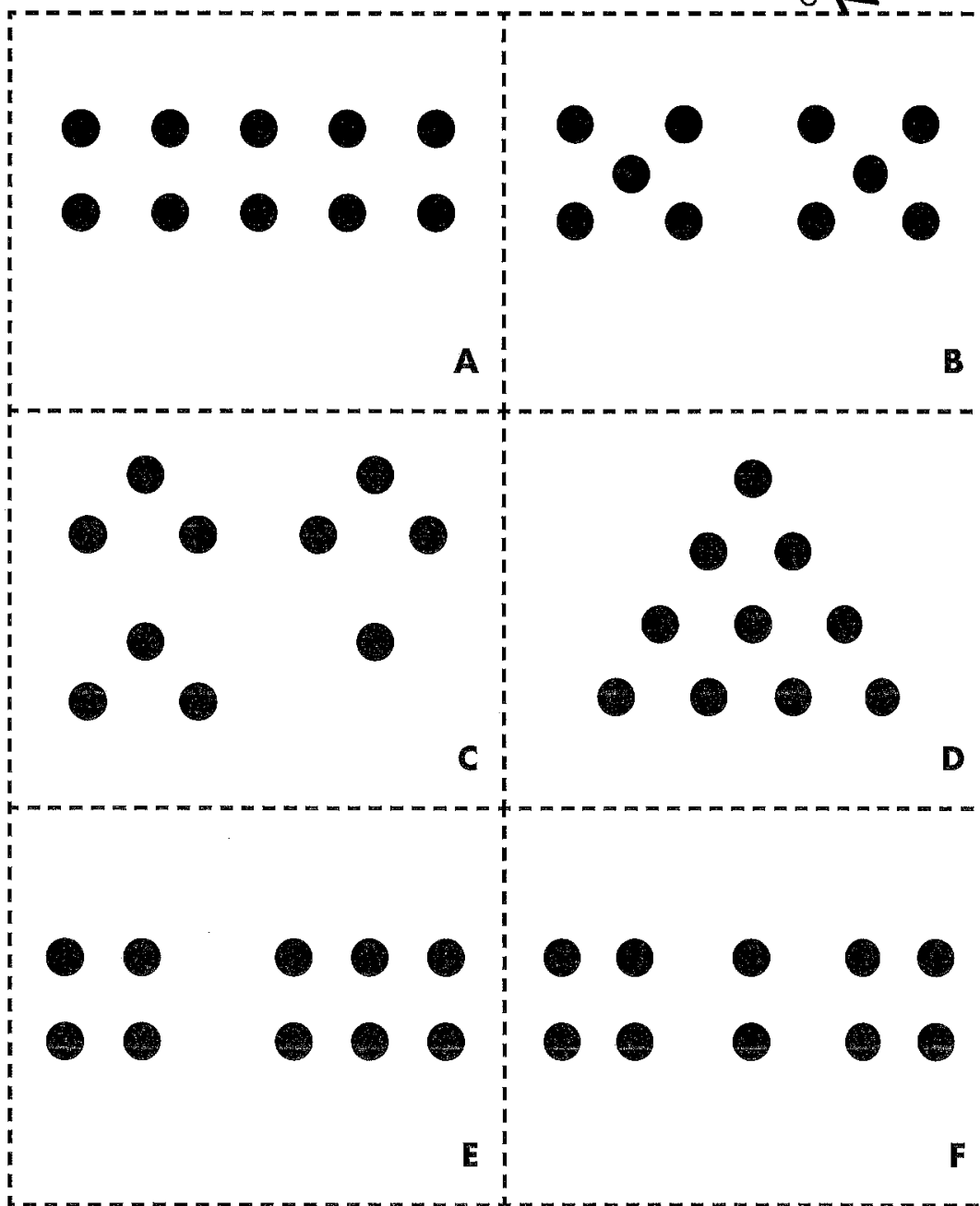
Number Sense in Your Classroom

- ▶ Plan task/activity focusing on one standard and one standard for math practice involving the use of visuals to develop/extend number sense.















Homework

- ▶ Complete the task/activity you started working on this afternoon.
- ▶ Read pages 1–11 and 33–53 in Number Sense Routines book.
- ▶ Bring back a number sense activity you did with your students and reflections to the following questions:
- ▶ How did the use of visuals supports students' developing number sense?
- ▶ What evidence did you see of students engaging in the math practices? Which practices?
- ▶ What challenges, if any, did students encounter?